

**ABSTRACT**

Systems and methods that neutralize ion beams in implantation processes are provided. The methods involve introducing a gas into the ion beam. The gas, for example, can be introduced into a region defined by an electrode through which the ion  
5 beam travels. The gas increases the generation of electrons in the beam which, in turn, neutralizes the beam. The neutralized beam has a reduced tendency to diverge (i.e., greater beam stability) during transport which can increase the beam current delivered to the wafer and implant uniformity, amongst other advantages. The systems and methods are particularly useful in limiting the divergence of low energy ion beams.

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